

**WHAT IS CLAIMED IS:**

1           1.     An alkaline battery comprising:  
2                 a cathode comprising an active cathode material including lambda-manganese  
3 dioxide;  
4                 an anode comprising zinc;  
5                 a separator between the anode and the cathode; and  
6                 an alkaline electrolyte contacting the anode and the cathode,  
7           wherein the active cathode material has a specific discharge capacity to a 0.8V cutoff  
8 of greater than 290 mAh/g at a discharge rate of 20 mA/g of active cathode material.

1           2.     The battery of claim 1, wherein the active cathode material has a specific  
2 discharge capacity to a 0.8V cutoff of greater than 300 mAh/g at a discharge rate of 20 mA/g  
3 of active cathode material.

1           3.     The battery of claim 1, wherein the battery has a specific discharge capacity to  
2 a 0.8V cutoff of 310 mAh/g or greater at a discharge rate of 20 mA/g of active cathode  
3 material.

1           4.     The battery of claim 1, wherein the lambda-manganese dioxide is heated to a  
2 temperature of less than 150°C.

1           5.     The battery of claim 1, wherein the lambda-manganese dioxide is heated to at  
2 a temperature of 120°C or less.

1           6.     The battery of claim 1, wherein the lambda-manganese dioxide has a B.E.T.  
2 surface area of greater than 4 m<sup>2</sup>/g.

1           7.     The battery of claim 1, wherein the lambda-manganese dioxide has a B.E.T.  
2 surface area of greater than 8 m<sup>2</sup>/g.

1           8.     The battery of claim 1, wherein the lambda-manganese dioxide has a total  
2 pore volume of from 0.05 to 0.15 cubic centimeters per gram.

1           9.     An alkaline battery comprising:  
2                 a cathode comprising an active cathode material including lambda-manganese  
3 dioxide having a total pore volume of from 0.05 to 0.15 cubic centimeters per gram, and the  
4 lambda-manganese dioxide has a B.E.T. surface area of greater than  $8 \text{ m}^2/\text{g}$ , wherein the  
5 lambda-manganese dioxide is heated to a temperature of  $150^\circ\text{C}$  or less;  
6                 an anode including zinc;  
7                 a separator between the anode and the cathode; and  
8                 an electrolyte contacting the cathode, the anode and the separator.

1           10.    The battery of claim 9, wherein the active cathode material has a specific  
2 discharge capacity to a 0.8V cutoff of greater than 290 mAh/g at a discharge rate of 20 mA/g  
3 of active cathode material.

1           11.    The electrochemical cell of claim 10, wherein the active cathode material has  
2 a specific discharge capacity to a 0.8V cutoff of greater than 300 mAh/g at a discharge rate of  
3 20 mA/g of active cathode material.

1           12.    A method of manufacturing an alkaline battery comprising:  
2                 providing a positive electrode including an active cathode material including  
3 lambda-manganese oxide; and  
4                 forming a battery including the positive electrode and a zinc electrode,  
5                 wherein the active cathode material has a specific discharge capacity to a 0.8V cutoff  
6 of greater than 300 mAh/g at a discharge rate of 20 mA/g of active cathode material.

1           13.    The method of claim 12, wherein providing the electrode includes preparing  
2 lambda-manganese dioxide by a method comprising:  
3                 contacting water with a compound of the formula  $\text{Li}_{1+x}\text{Mn}_{2-x}\text{O}_4$ , wherein x is

4 from -0.02 to +0.02;  
5 adding an acid to the water and compound until the water has a pH of 1 or  
6 less;  
7 separating a solid from the water and acid; and  
8 drying the solid at a temperature of 120°C or below to obtain the lambda-  
9 manganese dioxide.

1 14. The method of claim 13, wherein the compound has a B.E.T. surface area of  
2 between 1 and 10 m<sup>2</sup>/g.

1 15. The method of claim 13, wherein the compound has a total pore volume of  
2 between 0.05 and 0.15 cubic centimeters per gram.

1 16. The method of claim 13, wherein the compound of the formula  $\text{Li}_{1+x}\text{Mn}_{2-x}\text{O}_4$   
2 has a spinel-type crystal structure.

1 17. The method of claim 13, wherein the solid is dried at a temperature of less  
2 than about 100°C.

1 18. The method of claim 13, wherein the solid is dried at a temperature between  
2 50°C and 70°C.

1 19. The method of claim 13, wherein x is from -0.005 to +0.005.

1 20. The method of claim 13, wherein contacting water and the compound includes  
2 forming a slurry.

1 21. The method of claim 20, wherein the slurry is maintained at a temperature  
2 below 50°C.

1 22. The method of claim 13, wherein the acid concentration is between 1 and 8  
2 molar.

1           23.     The method of claim 13, wherein the acid is sulfuric acid, nitric acid,  
2     perchloric acid, hydrochloric acid, toluene sulfonic acid, or trifluoromethyl sulfonic acid.

1           24.     The method of claim 20, wherein the temperature of the slurry is maintained  
2     substantially constant during the addition of acid.

1           25.     The method of claim 13, wherein the pH is 1 or less.

1           26.     The method of claim 13, further comprising washing the solid separated from  
2     the water and acid with water until the washings have a pH greater than 6.